

CASE STUDY

Vattenfall select Netcon 3000

Netcontrol's distributed SCADA system Netcon 3000 improves customer service



ABOUT VATTENFALL

Electricity distribution company Vattenfall Verkko Oy has been established 1st of July 2002. The company was created through merging six companies owned by Vattenfall:

- Hameen Sahko Oy
- Keski-Suomen Valo Oy
- Lapuan Sahko Oy
- Heinola Energia Oy
- Hameenlinnan Energia Oy
- Revon Sahko Oy

Since Vattenfall started the business acquisitions in Finland at 1995 the activities, systems, and techniques of the acquired companies have been unified all the way. Seven separate Network Control Systems were controlling the Electrical network: the systems were of Netcon, Nematic and Microscada brands; each different from each other and all made of techniques getting old. They didn't support any more services and functionalities demanded for state of the art control of electrical networks. Distribution Management System was in operation in Central-Finland only. Life cycle of the systems was coming to its end and the maintenance

costs were high. Also the working procedures in operations were different.

We considered the procurement of an integrated Network Control System already at the shift of the millennium but decided to postpone it beyond the Year 2000 rush time. Old systems functioned well over the millennium shift without any major back-ups or modifications.

The renewed Network Control System serves the management of the electrical network but also remote heating and power production. The electrical network is controlled from the city of Tampere and, when needed, in a distributed way from the regional operator sites. The control of production sites and remote heating network is outsourced and is managed from the city of Porvoo. Network data is managed by Xpower system from Tekla and by DMS –Distribution Management System working as a part of Xpower. Normally the management of the electrical network takes place from the Dispatch Centre located in Tampere. During the normal working hours the control for the working interruptions are activated from the regional centres by the regional operator personnel.



The Dispatch Centre operates 24 hours a day through the year in three shifts. In the field we have electricians and technical staff as stand-by to start correction of faults when such appear. For repairing of faults we use additionally our contractors. Besides our fault-telephone automat the incoming fault calls are answered by our customer service during normal office hours and the Control Centre outside the normal office hours.

When needed, e.g. because of major network disturbances the control and switching operations are distributed to the local control sites.

PROJECT MANAGEMENT IMPLEMENTED IN DEDICATED SUB PROJECTS

The renewal of the Network Control System was divided into several projects: clarification of telecommunication networks and data

transmission, pre clarification and procurement of the Network Control System, implementation of the dispatch centre, implementation of the Distribution Management and changes in the protection at the substations for calculation of the fault currents.

CLARIFICATION OF THE TELECOMMUNICATION NETWORK

For renewal of the systems we first, in co-operation with Ramse Oy, carried out a clarification of telecommunication networks and data transmission systems related to Network Operations. As the result of that clarification we outsourced the trunk link networks and the respective personnel as well as entered into service contracts for procuring those services. Data transmission systems (links, cables, etc) remained as our property but the maintenance services of those are a part of the service contracts.





PRE CLARIFICATION OF THE NETWORK CONTROL

The status and techniques of the existing systems were clarified together with Ramse Oy. Special attention was paid for recognizing the various types of RTU's, existing data transmission protocols and evaluation of the condition and expected lifetime of the equipment as well as feasibility to use those equipment in the future. Based on the clarification we decided on an approach that most of the existing RTU's need to be interfaced to the new Network Control System. We identified 13 different protocols and 31 different RTU types.

PROCUREMENT PROJECT

For the procurement we drew up the needed procurement documentation in English together with Ramse Oy. Based on the high quality of the procurement documents the tenders were relatively easy to compare with each other. We received several good tenders. We selected Netcon 3000 system from Netcontrol Oy. Main reasons, amongst others, that influenced on our decision were price/quality relation, flexibility, distributable features of the system and management of different protocols.

CHALLENGES OF THE IMPLEMENTATION

The major challenge in this project has been setting up the system simultaneously with many other remarkable changes taking place in the company. Resources have been stretched up to their limits and the project was experiencing pressures due to other ongoing changes. From the System point of view the major challenges have been the distributed system concept and the protocols. Netcontrol Oy has managed even these issues well. The distributed system as well as the protocols works well. A large number of precisions to the original specifications and changes deemed to be needed have been implemented during the delivery. Thanks to supplier's flexible way to manage the project these changes have been possible to carry out.

THE NETWORK

- 110 kV overhead lines 1000 km
- 45 kV overhead lines 400 km
- 20 kV overhead lines 21 500 km
- 0,4 kV lines 36 700 km
- Transformer stations 20 400 pcs
- Remote controlled disconnecter stations 400 pcs
- Customers 360 000 pcs



THE PROJECT

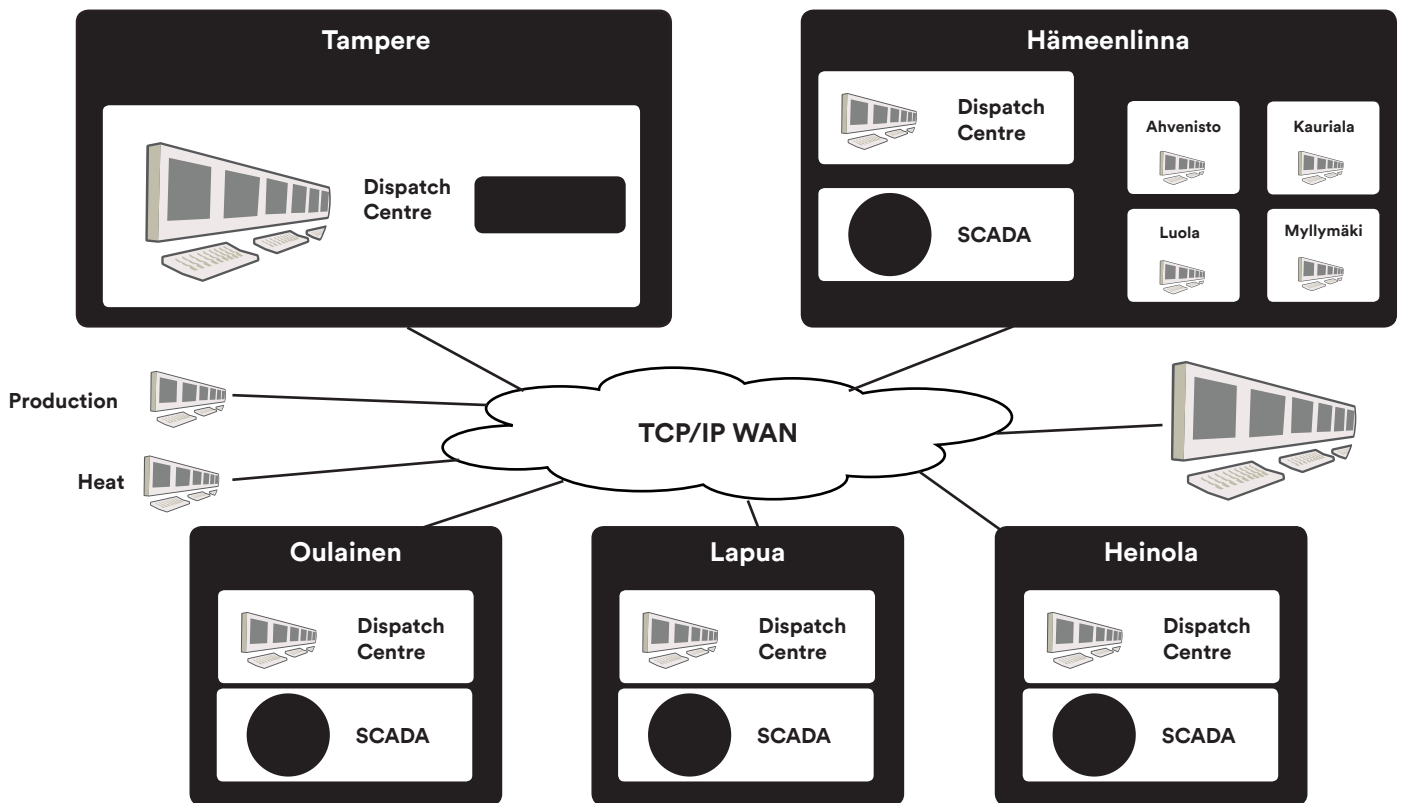
- Preplanning 8/2000 – 5/2001
- Procurement decision 9/2001
- Planning 9/2001 – 4/2002
- Data capture 9/2001 – 4/2002
- Development system 4/2002
- FAT 2/2002 – 9/2002
- CC Tampere 9/2002 – 1/2004
- Commissioning 10/2002 - 3/2004
- Large Display Unit 12/2003 - 2/2004
- Test run and tests 6/2004 – 10/2004
- Acceptance 12/2004

In total 640 Remote Terminal Units out of which 390 disconnecter RTU's. Relays are not considered as RTU's. Database sections 49 000

pieces, I/O points about 40 000 pieces. Analogue measurements 4 800, setpoints 1 000 pieces, indications (single and double altogether) 22 000, controllable objects 5 300, pulse counters 440 pieces. Manually updatable line disconnectors about 12 000 pieces. Displays and schemes about 1200 pieces.

- 5 pcs duplicated Netcon@3000 SCADA servers
- 6 pcs duplicated Netcon@NFE data transmission units
- 1 pc Netcon@NFE data transmission unit
- 1 pc duplicated Netcon@3000 historical data server
- 3 pcs multi user Netcon@3000 Terminal Servers
- 7 pcs Netcon@3000 maintenance work stations
- 9 pcs Netcon@3000 work stations





RTU PROTOCOLS

- Procol
- Spacom
- IEC 870-5-101
- Modbus
- Siemens 3964R
- RP570
- RP571
- Netcon 8830
- Netcon 8810
- Ansi
- AnsiLapua
- Elektro-Arola
- Telegyr 102

The trunk data transmission connections have been physically duplicated by using separate routes. Each connection section has 512 kb – 2 Mb prioritized capacity.

SCHEDULE AND RESOURCES

We were forced to postpone the original schedule by 4 months due to Janika storm and another 4 months due to organisational changes and transfer of Control Centre from Hämeenlinna to Tampere.

The project took some 13 man years of own resources. The own resources consisted mainly of key persons of project team and electricians and technical resources needed in the field during the commissioning. Installation services for data transmission systems and for changes of RTU's were procured from third parties. Budget was met throughout the whole project. Project Managers: Hannu Hirvinen from Netcontrol Oy and Markku Vanska from the buyer.





EXTENT OF THE SYSTEM

There are 4 workstations in the Control Centre and each 5 regional subsystems include 1 – 2 workstations. All Control sites are equipped with workstations for Distribution Management.

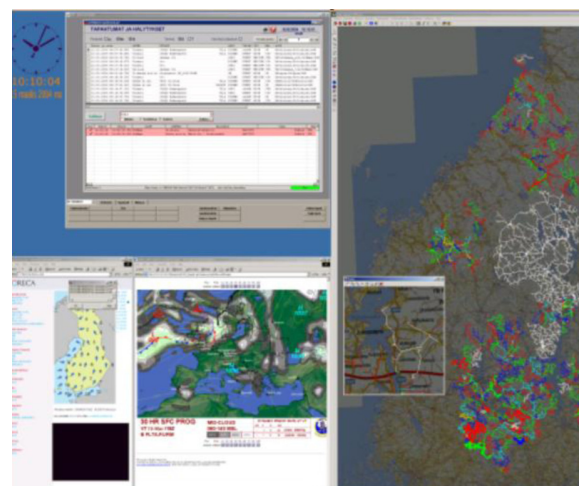
FLEXIBLE FEATURES

Opportunity for distributed operations is one of the most essential features of the system. In principle what ever region or the whole network may be managed from which ever Control Site. Distributed subsystem may also work as an island in case both of the trunk data transmission lines would be out of service. In such case the network may be controlled over the island region only.

The flexible modifiability and transferability were tested during the project when the Control Centre was transferred from Hämeenlinna to Tampere – all this without any bigger problems.

SECURITY

All the critical parts of the system are duplicated: data transmission network, Scada servers, historical data servers, RTU data transmission servers (NFE). Main (Master) server updates the process data to the work stations, historical data server and



to supplementary systems as well as to stand-by Reserve (Slave) server. Reserve server is constantly on-line updated ready to continue Main server's duties. The main server may be shut down during the operation without any disturbances for the control of the process nor that the operators would even notice what happened.

INTERFACES TO OTHER SYSTEMS

The system includes different interfaces through which data of the system may be updated to other systems or vice versa; collect data from the external systems. All external connections are duplicated and accomplished by Scada servers. The DMS Distribution Management System from Tekla has been connected to KAVA system via Elcom 90 interface. All status changes of switching equipment and defined measurements of the process are transmitted to the Distribution Management System; in case of network disturbances also the data needed for localisation of the fault place is transmitted.

Management of relay parameters is worthwhile to mention as one of the features.

LARGE DISPLAY UNITS

Control Centre was equipped with Large Display Unit from Barco with 4 screens, 67". UXGA 1600x1200 resolution (3200x2400 resolution as total). The Unit is a excellent tool for visualising the overall status of the network.

EXPERIENCES

At the moment and in the existing extent we have now some more than one year operating experience of Netcontrol's Network Control System. The operators have been satisfied with operability and reliability of the system. Ease of use has also met our expectations. Our selection for the operative Network Control System has been the right one.

The targets set for the renewal of the Network Control and of the supportive techniques have been achieved as planned. We can serve our customers better than before by an integrated control system which covers the whole operative area. Management and actions to take care of fault situations has improved. Regarding major network disturbances we manage the overall situation and on-line information much better and faster than in past. We can serve our customers and contact groups by much better and more on-line information than before.



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